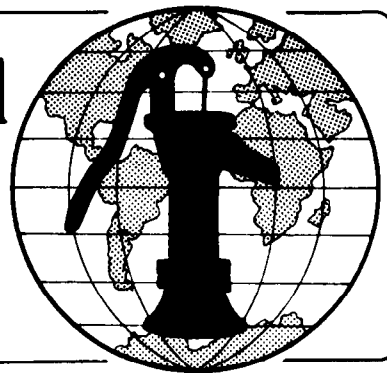


# Water for the World

## Constructing, Operating and Maintaining Sumps, Soakage Pits, and Soakage Trenches

Technical Note No. SAN. 1.C.7.



Sumps, soakage pits, and soakage trenches receive washwater or effluent from an aqua privy and allow it to soak safely into the ground. Constructing these disposal systems involves digging a sump, pit, or trench; lining it with bricks or stones or filling it with gravel or rocks; and, in the case of a soakage pit or trench, laying a pipe from the dwelling or aqua privy to the pit or trench. These systems are operated by pouring washwater into a sump, a sink or drain in the dwelling, or an aqua privy. They must be inspected periodically and any problems corrected.

Properly constructed sumps can last 1 to 5 years, and soakage pits and soakage trenches 5 to 15 years. This technical note describes each step in constructing, operating, and maintaining simple washwater disposal systems. Read the entire technical note before beginning construction.

### Useful Definitions

**EFFLUENT** - Settled sewage.

**WASHWATER** - Water that has been used for bathing, washing clothes, dishes or kitchen utensils.

### Materials Needed

The project designer must provide three items before construction can begin:

1. Location map, similar to Figure 1, showing the correct location of the washwater disposal system.

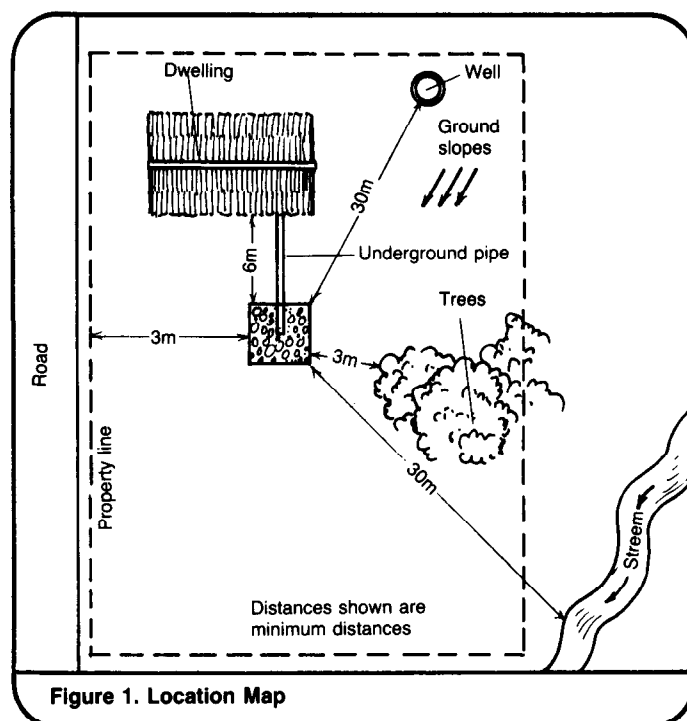
2. Technical drawings, similar to one or more of Figures 2, 3, 4, and 5, showing the correct dimensions of the system.

3. Materials list, similar to Table 1, showing all labor supplies, and tools needed to construct the system. In addition, you will need all labor, supplies and tools in the materials list.

### Caution!

1. When digging a pit more than 1.5m deep, shore up the sides to prevent a cave-in that could be fatal to a worker in the pit.

2. Construct the washwater disposal system at the exact site and to the dimensions specified by the project designer.



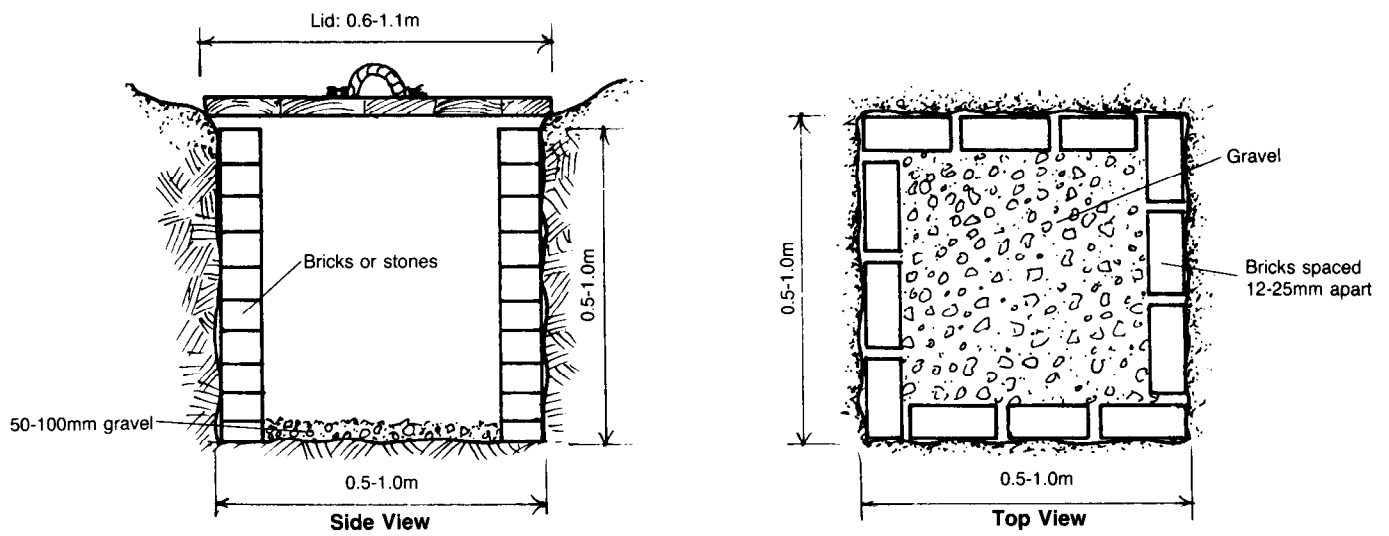


Figure 2. Pit-type Sump

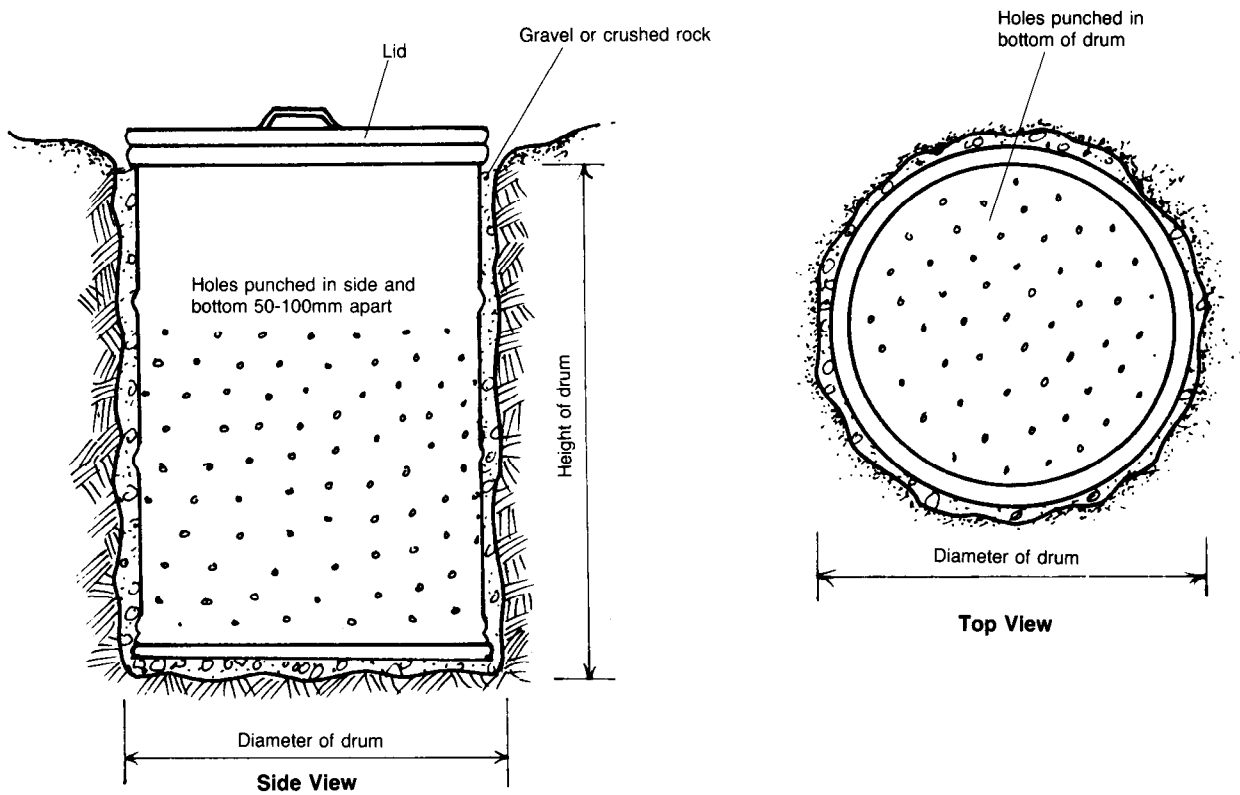
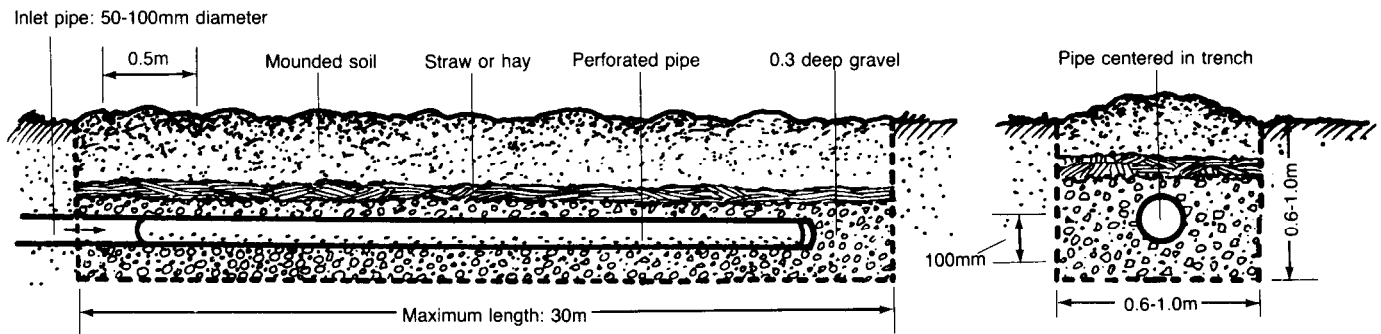
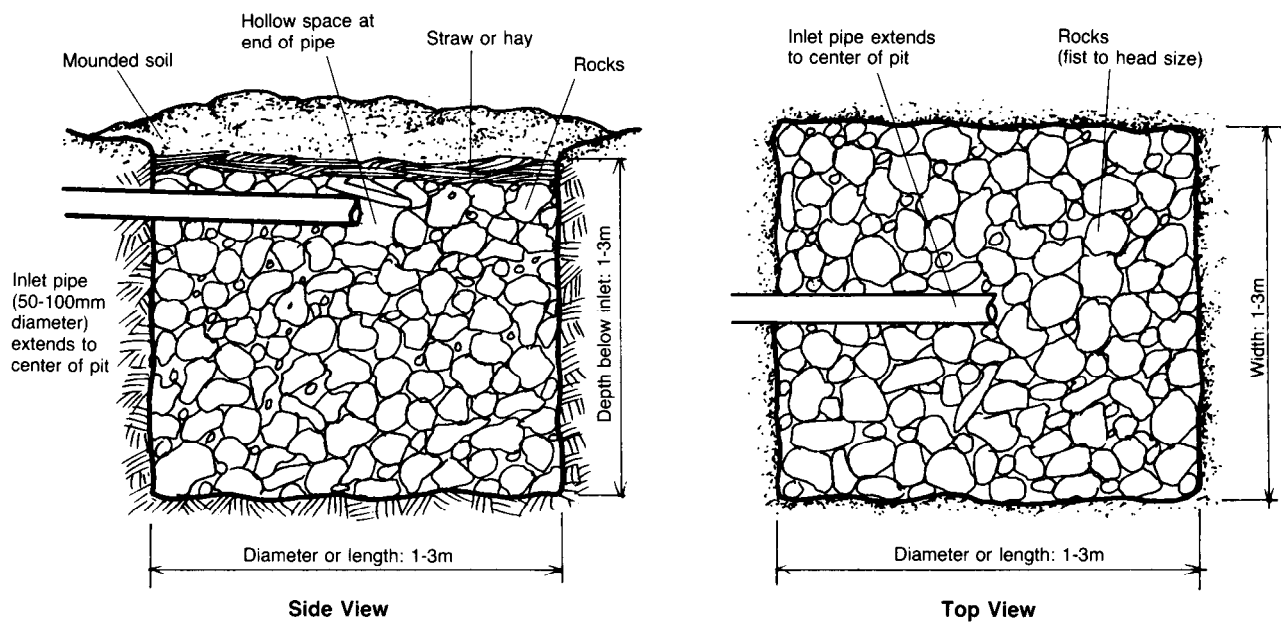


Figure 3. Drum-type Sump



**Figure 4. Soakage Trench**



**Figure 5. Soakage Pit**

## Construction Steps

Depending on local conditions, availability of materials, skills of workers, and so on, some construction steps will take only a few hours, while others may take a day or more. Table 2 shows a sample work plan for building a privy shelter including time estimates for each step. Draw up a similar work plan with rough time estimates for each step based on local conditions. You will then have an idea of when specific workers, supplies, and tools must be available during the construction process.

For a pit-type sump:

1. Assemble all laborers, supplies, tools, and drawings needed to begin construction. Study all diagrams carefully.

2. Use the location map and a measuring tape to lay out the dimensions of the sump on the ground.

3. Dig the hole to the depth specified by the project designer. Make the bottom of the hole fairly level.

4. Lightly rake the sides of the hole with a rake, shovel, or branches. This will allow washwater to soak in quicker.

5. Line the sides of the hole with concrete blocks, bricks, or stones as shown in Figure 6. Leave spaces of 25-50mm between the bricks.

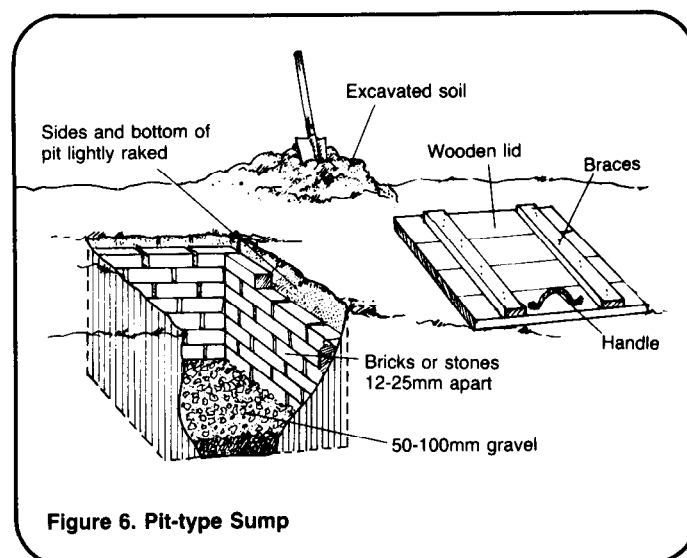


Figure 6. Pit-type Sump

Table 1. Sample Materials List for Washwater Disposal System

Item	Description	Quantity	Estimated Cost
Labor	Foreman	1	_____
	Laborers	2	_____
Supplies	Gravel or pebbles (enough to fill trench to a depth of 0.3m)	_____ m <sup>3</sup>	_____
	Straw (enough to cover entire trench)	_____	_____
	Galvanized metal pipe, 100mm diameter, extends from dwelling to trench	_____ m	_____
	Open-jointed pipe (length of trench)	_____ m	_____
Tools	Measuring tape	1	_____
	Shovels	2	_____
	Wheelbarrow	1	_____
	Other	_____	_____

Total Estimated Cost = \_\_\_\_\_

**Table 2. Sample Work Plan for Soakage Trench**

Time Estimate	Day	Task	Personnel	Tools/Materials
2 hours	1	Lay out system on ground	Foreman (present during all construction) One laborer	Measuring tape
2 hours	1	Excavate trench for pipeline	Two laborers	Shovels
2 hours	1	Lay pipeline	Two laborers	100mm diameter pipe; mortar
1 hour	1	Cover pipe with soil; test flow	Two laborers	Shovels
8 hours	2	Excavate soakage trench	Two or more laborers	Shovels
½ hour	3	Rake bottom and sides of trench	Two laborers	Rakes
2 hours	3	Spread gravel 150mm deep	Two laborers	Gravel, shovels, wheelbarrow
2 hours	3	Extend pipeline 0.5m; lay perforated distribution pipe	Two laborers	100mm diameter distribution pipe; mortar
2 hours	3	Spread gravel 50mm over top of pipe	Two laborers	Gravel; shovels
½ hour	3	Spread straw over gravel	Two laborers	Straw; rakes
1½ hours	3	Cover with soil, mound, lightly tamp	Two laborers	Shovels
2 hours	17	Plant grass over system	Two laborers	Grass seed; rakes

6. Lightly rake the bottom of the hole. Do not stand in the hole after this step or the bottom may become compacted and prevent washwater from soaking in readily.

7. Spread 50-100mm of gravel or small pebbles on the bottom of the hole.

8. Build a lid with wood or metal and cover the hole. The lid should be strong enough to prevent a person from falling through and it should keep out rain. A large rock may be placed on the lid to stop children from removing it. You may also surround the sump with a low mounded ring of soil to prevent surface water from flowing in.

For a drum-type sump:

1. Assemble all laborers, supplies, tools, and drawings needed to begin construction. Study all diagrams carefully.

2. Use the location map and a measuring tape to lay out the site for the sump.

3. Use a hammer and spike or large nail to punch holes in the bottom and the lower half of the sides of a 200-liter steel drum as shown in Figure 7. The inside edges of the holes may be jagged and sharp. Be careful to avoid cuts.

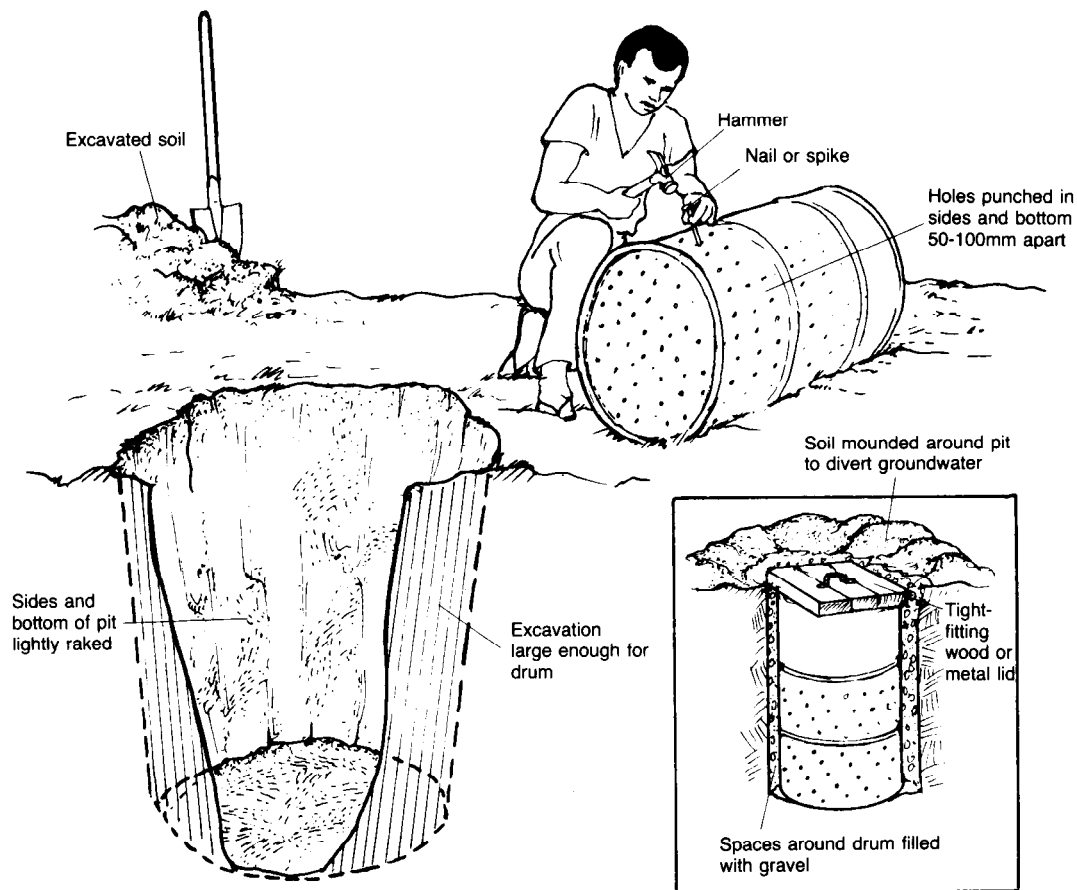
4. Dig a hole at the site just large enough to hold the drum.

5. Lightly rake the sides and bottom of the hole with a rake, shovel, or branches to allow washwater to soak in quicker. Do not stand in the hole after this step because the bottom may become compacted.

6. Lower the drum into the hole.

7. Fill in the space between the drum and the hole with gravel, pebbles, or small rocks, as shown in Figure 7.

8. Cover the drum with a lid. The lid should be strong enough to prevent a person from falling through and it should be waterproof to keep out rain. A large rock may be placed on the lid to stop children from removing it. You



**Figure 7. Drum-type Sump**

may also surround the sump with a low mound of soil to prevent surface water from flowing in.

For a soakage pit:

1. Assemble all laborers, supplies, tools, and diagrams needed to begin construction. Study all diagrams carefully.

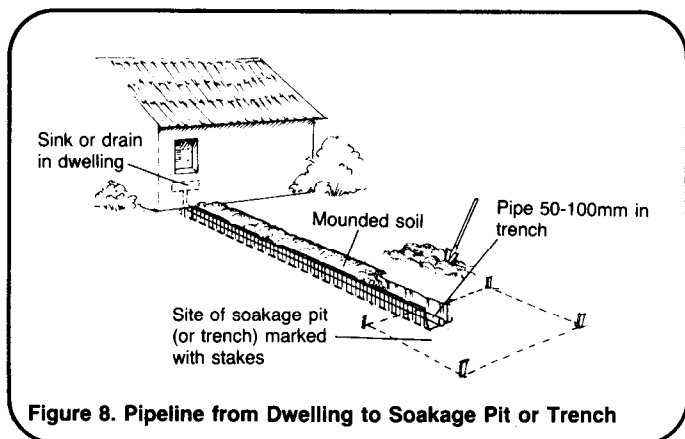
2. Use the location map and a measuring tape to lay out on the ground the dimensions of the pit and the trench for the pipeline. The trench extends from the dwelling or aqua privy to the pit in as straight a line as possible.

3. Dig the trench for the pipeline as shown in Figure 8. The bottom of the trench should slope evenly downward, about 1 unit downward for every 50-100 units in distance, from the dwelling or aqua privy to the pit site. The trench need be no wider than 0.3m and no deeper than 0.3m

4. Lay 50-100mm diameter pipe in the trench and connect it to the sink or drain in the dwelling or the overflow pipe of the aqua privy. Seal all pipe connections with mortar or other material. The pipe should extend to the edge of the pit site.

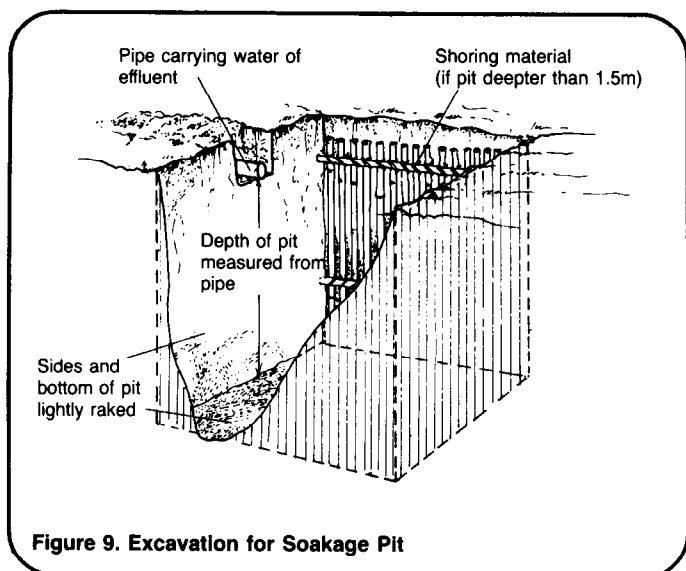
(NOTE: If this pipe carries effluent from an aqua privy, it must be made of non-corrosive material such as vitrified clay or plastic. If the pipe carries only washwater, it may be made of galvanized metal.)

5. Carefully cover the pipe with soil to protect it from damage, mound to allow for settling, and gently tamp. Pour water in the sink, drain, or aqua privy to be certain that it flows through the pipe. If it does not, the pipe will have to be uncovered, and the problem found and corrected.



6. Excavate the pit to the length, width or diameter, and depth specified by the project designer. The depth is measured downward from the end of the pipe, not from the surface of the ground. If the pit is deeper than 1.5m the sides must be shored up as shown in Figure 9 with boards, poles, bamboo, or other local material to prevent a cave-in. The bottom of the pit should be fairly level. Lightly rake the sides and bottom of the pit.

7. Begin filling the pit with rocks. They should range from fist-size to head-size and they should be fairly clean, because any loose soil will clog the spaces between the rocks.



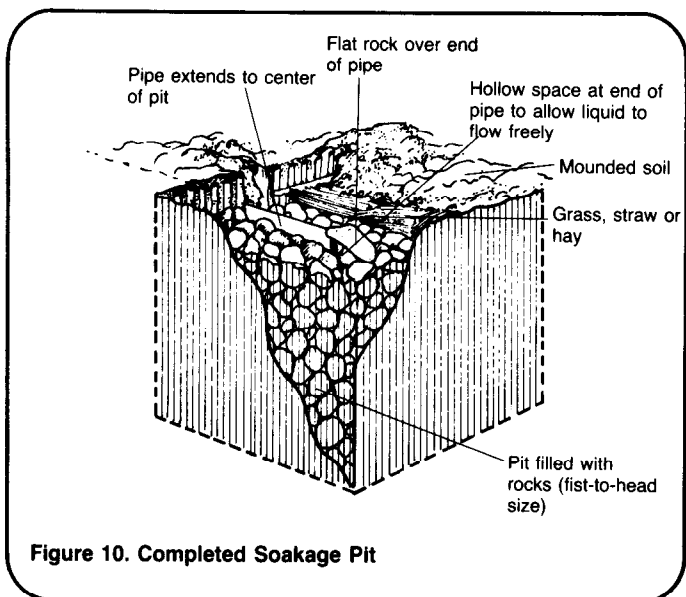
8. When the rocks reach nearly the level of the inlet pipe, extend the pipe to a point near the center of the pit. Make a small hollow space in the rocks to allow a free flow of washwater or effluent. Lay a flat rock over the end of the pipe as shown in Figure 10.

9. Put in more rocks or stones, filling the pit to at least 100mm above the top of the pipe.

10. Cover the rocks with a layer of straw, hay, or grass to prevent dirt from sifting down between the rocks.

11. Cover the entire pit area with soil, mound to allow for settling, and gently tamp.

12. When the mound has settled, perhaps after a week or two, plant grass over the pit. This will help prevent erosion caused by wind, rain, or surface water.



For a soakage trench:

1. Follow steps 1 through 5 for a soakage pit, substituting "soakage trench" for "pit."

2. Dig the soakage trench to the width, depth, and length specified by the project designer. The trench should slope downward gradually and evenly away from the inlet pipe, about 1 unit down for every 100-200 units in distance.

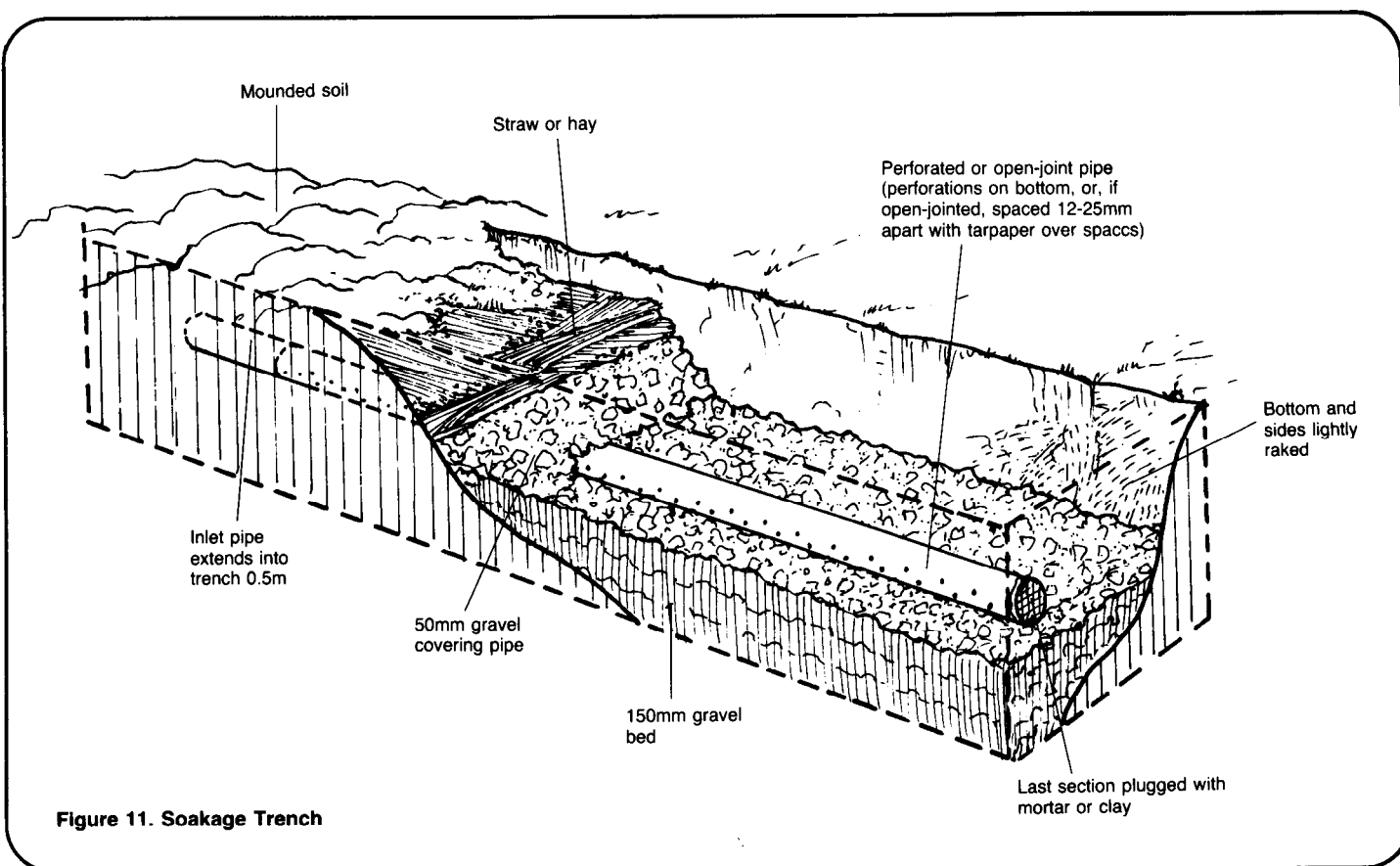


Figure 11. Soakage Trench

3. Lightly rake the sides and bottom of the trench to allow washwater to soak in quicker. Do not walk in the trench after this step because the bottom may become compacted.

4. Fill the trench with gravel or pebbles up to the bottom of the inlet pipe. This should be 100-150mm of gravel.

5. Extend the inlet pipe about 0.5m into the soakage trench.

6. Lay in perforated or open-joint distribution pipe or concrete blocks. See Figures 11 and 12. If open-joint pipe or blocks are used, leave about 25mm between each pipe section or block. If blocks are used, their openings must face toward the length of the trench. If perforated pipe is used, the perforations must face downward. If non-perforated plastic pipe is available, it can be used as perforated pipe by drilling 12mm holes 150mm apart in two parallel rows along the bottom of the pipe, or as open-joint pipe by sawing it into 450mm sections.

7. Plug the end of the last section of pipe with mortar or other material. If open-joint or concrete blocks are used, cover the space between each pipe section or block with tar paper or other material to prevent gravel from sifting in.

8. Fill the trench with gravel or pebbles to a depth of 50mm above the top of the distribution pipe or concrete blocks.

9. Cover the gravel with hay, straw, or grass to prevent soil from sifting in and clogging the flow of washwater or effluent.

10. Cover the entire system with soil, mound to allow for settling, and lightly tamp.

11. When the mound has settled, perhaps after a week or two, plant grass over it. This will help prevent erosion caused by wind, rain, or surface water.



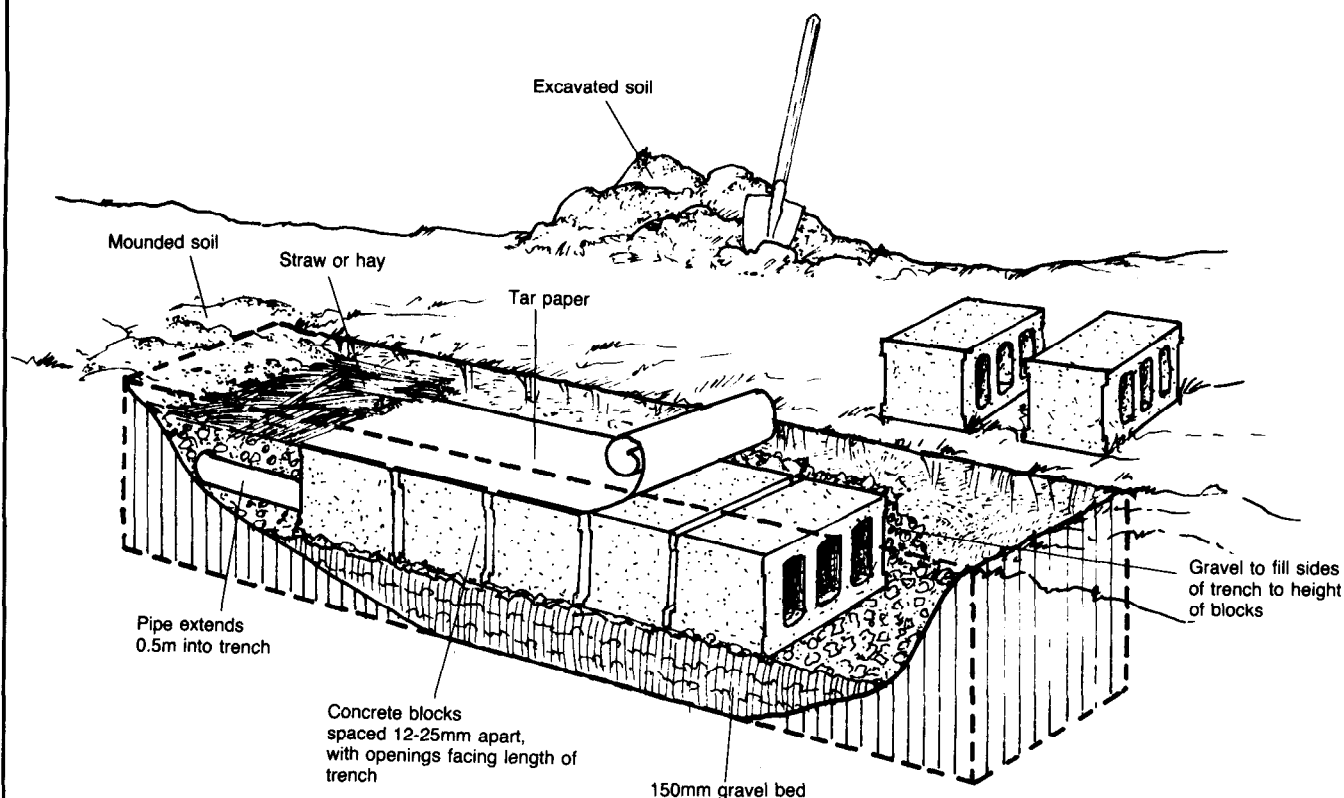


Figure 12. Soakage Trench Using Concrete Blocks

## Operating and Maintaining Washwater Disposal Systems

To operate a sump, lift the lid, pour in washwater, and replace the lid. The washwater will soak safely into the ground. To operate a soakage pit or soakage trench, pour washwater into a sink or drain in the dwelling or into an aqua privy. Washwater or effluent will flow through a pipeline to a pit or trench and be distributed by rocks or gravel, then soak safely into the ground.

Maintaining these systems involves inspecting them for erosion and system failure.

**Erosion.** If there is erosion on or near the system caused by wind, rain, or surface water, fill in the eroded areas with soil. Plant or resod grass over soakage pits and trenches. If surface water is a problem, build small dams or trenches to divert surface water.

**System Failure.** A washwater disposal system fails when the soil underneath and around it no longer absorbs the washwater or effluent, or when the washwater is absorbed slower than it flows in. When a system fails, it cannot be repaired. It must be abandoned and a new system built.

A sump is about to fail when washwater drains away so slowly that there is always about 0.2m of liquid in the sump. When a sump is abandoned, fill it with soil and mound to allow for settling.

A soakage pit or soakage trench is about to fail when unusually lush growth, wet areas, or puddles appear on or near the system or when there are continual odors. The pit or trench must be abandoned.

Although a washwater disposal system cannot be repaired, it is helpful to

review the major reasons for early failure so they may be avoided in future systems:

- Improperly located. The site was not tested adequately for soil suitability, groundwater levels, or impervious layers; the test results were incorrectly used; or the test results were ignored.

- Improperly designed. The system was designed too small, or the flow of washwater or effluent substantially increased after the system was designed.

- Improperly constructed. The system was not constructed according to design specifications. This could mean a number of things: the soakage trench slope was too steep; the distribution pipe was incorrectly installed; the open joints were filled in with gravel; the pit was not large enough; loose soil was allowed to sift in and clog the system, and so on.

When the system fails and a new system must be built, consult the project designer before beginning construction.